APPLICANT'S AFFIDAVIT

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Applicant(s): Arthur, James D.
Examiner: Berhane, Adolf D., Art Unit 2838

Rule 132 Declaration I - **Measurements of Wener Inductor Current**

James Arthur declares as follows:

1) I am the inventor in the above patent application.

2) On 8/26-8/28/2006 a functional prototype of the Wener device was constructed according to Wener (United States patent 6,366,028 B1, *Wener*, et al) Fig. 3, and Wener col. 5, Table 1.

3) On 8/28-8/29/2006 I measured the inductor current of said device, recording the waveforms with a Yokogawa model DL1540 digital oscilloscope.

4) Figures I-1 through I-3 of this document are true digital copies of said oscilloscope waveforms.

5) I additionally measured the following power consumption readings:

Supply Voltage	Current Drain
1.50 V	121 mA
1.29	65
1.00	13.6

6) I further declare that all statements made herein of my own knowledge are true and that all statements made upon information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application and any patent issuing therefrom.

Signed, Date:

James Arthur August 31rst, 2006

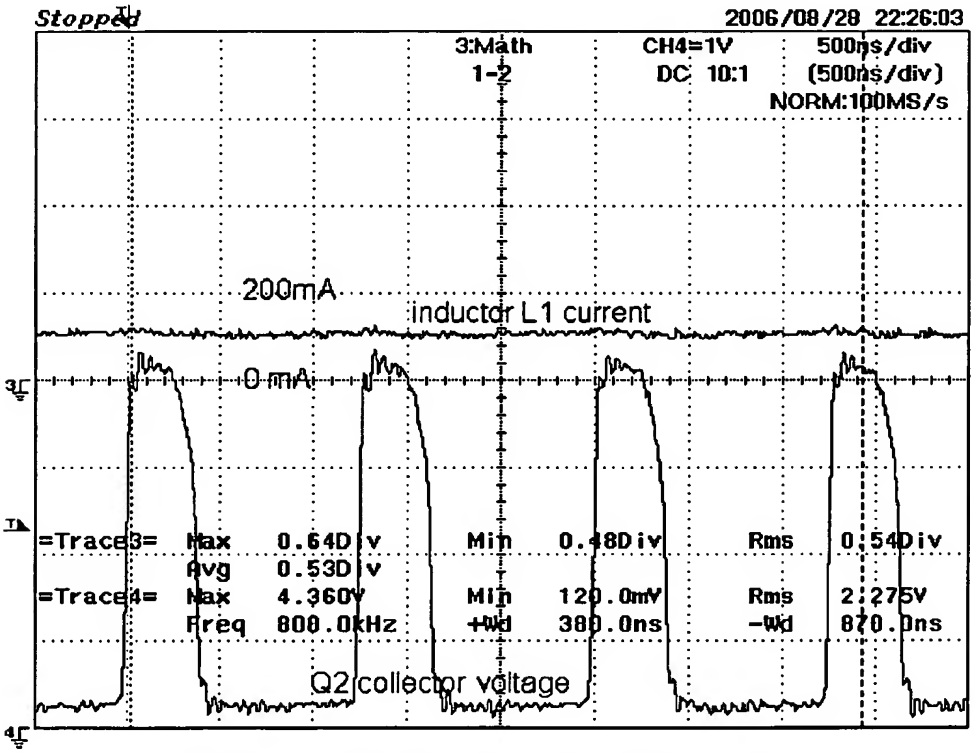
APPENDIX I. Measurements of the Wener Device, Applicant's Affidavit

DISCUSSION

Applicant has maintained that the Wener device (US Patent 6,366,028 B1) does not discharge its inductor, or teach an off-time equal to the time needed to substantially fully discharge its inductor.

Trace 4 of Figure I-1 below is an oscillogram showing the collector-voltage waveform of a Wener device constructed as per Wener Fig. 3, and Table 1 of *Wener* col. 5.

The "low" periods of the Q2 collector waveform reflect periods when inductor L1 is being charged ("on-time"), and the "high" periods represent times when inductor L1 is discharging into the LED load (Q2's "off-time").



Wener Inductor Current, Vcc=1.5V

Figure I-1

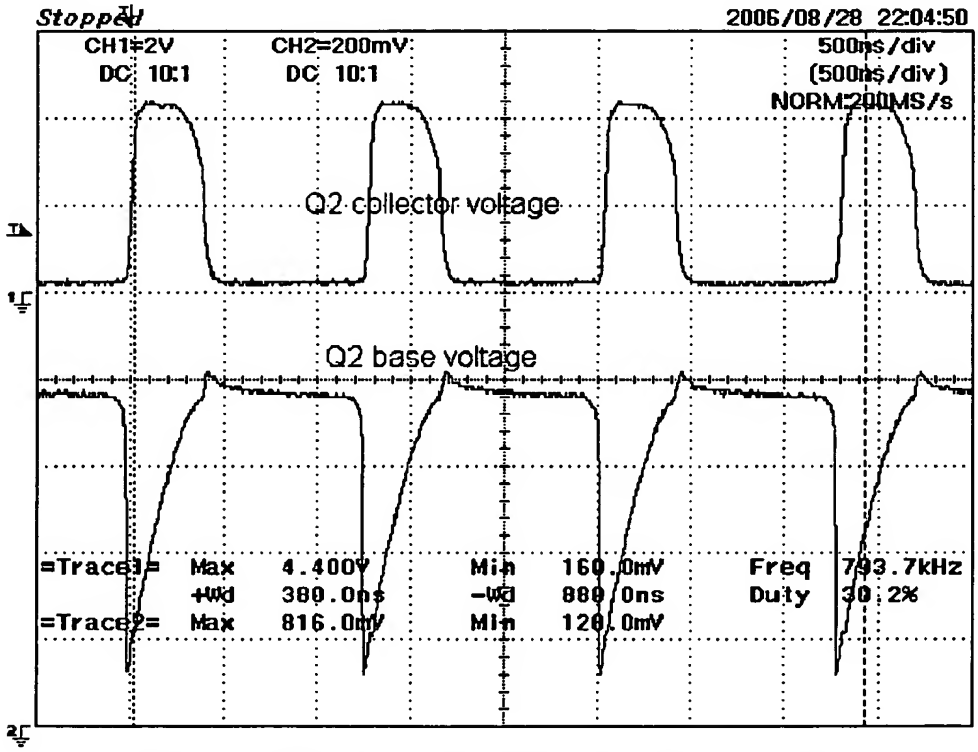
It can be seen from the oscilloscope Trace 3 waveform that inductor L1 carries a standing current (calculated by the oscilloscope to be 0.48 divisions) of 96 mA. Inductor L1 is *not* discharged.

It is immediately apparent that the current in inductor L1 increases slowly during Q2's on-time,

discharges by a small amount during Q2's off-time, and that a much longer off-time would be needed to fully discharge inductor L1. Accordingly, Wener *does not* provide an off-time sufficient to fully discharge inductor L1.

Off-Timing Is Controlled By R3-C3

Applicant has maintained that Wener's text and Wener's device both teach a device in which off-time is controlled by a fixed R-C timer. Figure I-2 below shows Q2's collector voltage as Trace 1, and Q2's base voltage as Trace 2. It can be seen that during the off-time Q2's base voltage is driven initially down by C3, then rises exponentially as C3 is charged by R3. When Q2's base voltage reaches 0.6 volts Q2 begins to turn on, starting to pull the Q2 collector voltage down, terminating the off-time.



Wener Off-timing waveforms, Vcc=1.5 V

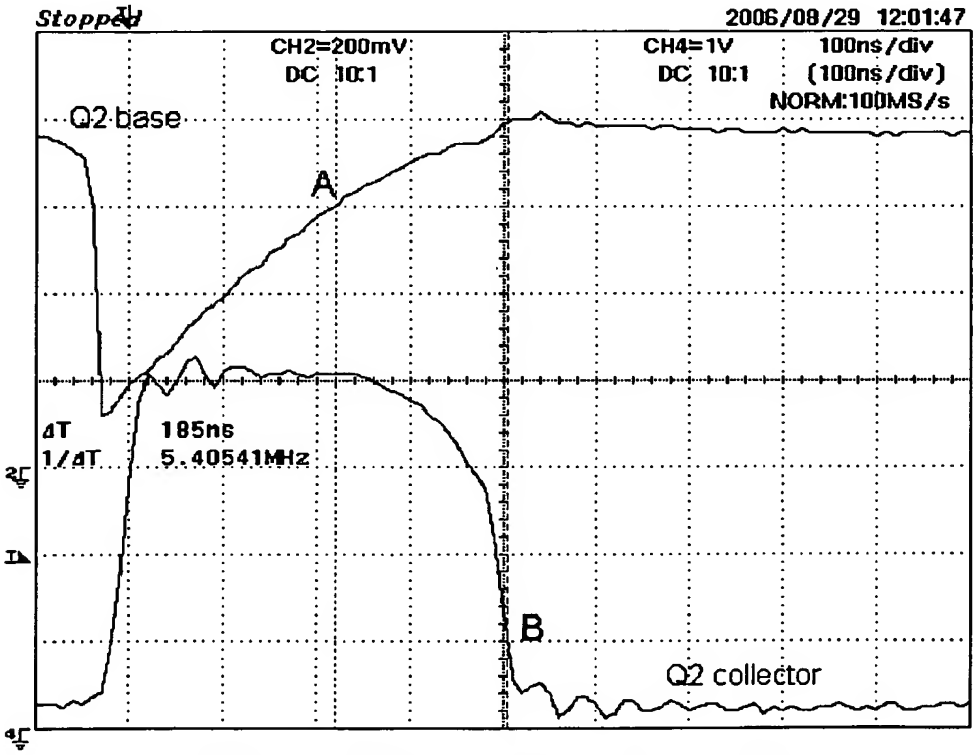
Figure I-2

This operation of the off-time being set by R3-C3 is exactly what *Wener* col 4, lines 28-32 describes:

"When the capacitor C3 charges up enough to allow the voltage at the base of the transistor Q2 to reach the turn-on threshold of the transistor Q2, the transistor Q2 turns on. This effectively connects the collector of the transistor Q2 to ground..."

The following further illustrates Applicant's contention that Wener's off-timer comprising R3-C3-Q2 is what terminates Wener's off-time, i.e., that Wener's off-time is controlled by this timer, and not by other means suggested by Examiner.

Figure I-3 is an expanded oscillogram of the Wener device's off-time. It can be seen that transistor Q2 begins to conduct when its base voltage reaches approximately 0.6 volts at time A, thereby commencing to end Wener's off-time *while inductor L1 is still discharging.* Complete discharge of L1, therefore, did not and *could not* have initiated this event. Q2 eventually pulls down its collector voltage by time B.



Wener, Off-time Detail, Vcc=1.48 V
Figure I-3

Therefore it can be seen that Q2 actively *causes* the end of the Wener off-time, consistent with Applicant's reading of *Wener* col. 4, lines 28-32 and col 4, line 65 to col. 5, line 3.

APPENDIX II. Applicant's Position Supported by Analysis of Wener Text

Applicant believes there exists a simple misunderstanding with respect to how the Wener device operates.

Applicant has attempted to dispel any misapprehensions by way of exhibits, measurements, and computations supplied in Applicant's Amendment A. However, Applicant believes he finally understands which passages in Wener has given rise to the misunderstanding thereof. These are addressed in the discussion below.

Wener's Off-Time Is Fixed

Applicant respectfully maintains that the Wener device is an ordinary multivibrator that drives an inductor. It sets its off-time by way of a simple, fixed off-timer comprising R3-C3. The operation of said off-timer is described in *Wener*, col. 4, lines 28-31. No means is provided in Wener's converter to adapt its off-time to supply voltage variations, however, notably, such adaptation is a necessary condition to producing the stabilized output of Applicant's Invention.

Applicant, by contrast, has claimed an *adaptive* off-timer that *incorporates* L1 as a timing element to provide an adaptive off-time interval, or alternatively, a method providing such an adaptive off-time. Said adaptive off-time interval varies according to the inductor's discharge time—and therefore with the converter's input voltage—thereby producing a stabilized output and numerous advantages not available in Wener.

Accordingly, the disputed facts hinge on the off-timing taught by Wener, and whether or not Wener teaches a stabilized converter possessing an adaptive off-time, where said off-time is determined by the time needed for the converter to fully discharge its inductor.

An Overview of Wener col 4, lines 33-65

Wener col. 4, lines 33-36 describes the operation of Wener's on-timer, C2-R2. *Wener* col 4, lines 37-43 describes how the on- and off-timers cooperate to form an oscillator producing sustained oscillations. *Wener* col. 4, lines 43-49 relates how said oscillator is then employed to drive inductor L1. *Wener* col 4, lines 50-60 describes the physical qualities of inductors in general, and *Wener* col.

4, lines 60-65 relates how these qualities are used to drive LED 16.

Instant Invention's Off-Time Is Adaptive

Applicant's device, in contrast with Wener's, claims an adaptive off-time equal to the time needed to fully discharge the inductor, which inherently acts to stabilize the output of Applicant's device. This off-time varies widely over the life of a dry-cell, and cannot be satisfied by Wener's simple R-C timer.

Wener Refers To A Different Voltage Reversal

In col. 4, lines 57-60, *Wener* describes describes a voltage reversal—produced across inductor L1 when Q2 is turned off—that "spikes up quickly." Said reversal might be confused with reversal cited in Applicant's claims, however, Wener is describing a *positive-going* spike which occurs at the *beginning* of the converter's off-time. Wener's inductor L1 is, at this point, *fully charged.*

Applicant's novel off-timing, however, relates to a second, *negative-going* voltage reversal, which can happen only later, at the *end* of the off-time interval, and only when (and if) the inductor L1 has already been substantially completely *discharged.* Therefore, the voltage reversal or "spike up" described in Wener col. 4, lines 57-60 at the *beginning* of Wener's off-time is *not* a voltage reversal signifying complete discharge of L1 as recited in Applicant's claims 8-29.

Wener's Inductor Has Not Been Discharged

Wener further elaborates that inductor L1's current has briefly fallen at this point

> "...from some maximum value to about zero) in a very short period of time." (col. 4, lines 59-60)

producing the aforementioned, positive-going "spike up" in voltage.

The Examiner has possibly interpreted the above to mean that the "spike up" results because inductor L1 has been fully discharged, or that because the external current flowing through the inductor L1 is said to be briefly zero that L1 has been discharged.

Neither is the case—it is physically impossible that the inductor has been discharged instantaneously, and this is not what Wener is describing. Wener is simply describing the boost

process—how a flyback voltage appears across inductor L1, which provides the voltage boost needed to drive LED 16. That inductor L1 is *charged*, not *dis*charged at this point, is made clear as Wener goes on to explain that inductor L1's *subsequent* discharge is *then* used to drive LED 16:

"...current starts flowing from the inductor L1 through the LED 16..." (lines 63-64),

which can only mean that L1 is charged, and is *just beginning* to be discharged, i.e., the converter's off-time has just begun; the time for the voltage reversal employed in Applicant's claimed[1] off-timer has not yet arrived.

Wener Does Not Disclose Applicant's Invention

So, this "spike" in Wener col 4, lines 57-60 refers to a first, initial, *positive-going* voltage reversal across inductor L1 that is due to the turn-off of transistor Q2 at the beginning of the converter's off-time; the transient described in Wener col. 4 lines 57-60 is *not* the second, terminal, *negative-going* voltage reversal claimed in Applicant's claims.

In short, this passage of Wener has *not* disclosed the complete discharge of the inductor that is at the crux of Applicant's claimed invention, *nor* has Wener disclosed hereby an adaptive off-time serving to stabilize the output of his converter. It may further be concluded from the fixed RC timing it recites that the Wener converter is *not* stabilized, and does *not* ensure an off-time interval commensurate with the time required to fully discharge its inductor.

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1 Some claims, e.g. 25, equivalently recite the time needed for complete discharge of the inductor.